**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION**
Air Permits Program

# TECHNICAL ANALYSIS REPORT
For
Air Quality Control Minor Permit AQ0381MSS02

United States Air Force
Clear Air Force Station

## Emergency Diesel Generators

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Date: Preliminary – June 4, 2010

# ABBREVIATIONS/ACRONYMS

AAC .....Alaska Administrative Code
Department .....Alaska Department of Environmental Conservation
CAFS.....Clear Air Force Station
EU.....Emission Units
ID.....Identification Number of Emission Units
MR&R.....Maintenance, Recording, and Recording
ORL.....Owner Requested Limits
PSD.....Prevention of Significant Deterioration
PTE.....Potential to Emit
ULSD .....Ultra Low Sulfur Diesel Fuel
USAF.....United States Air Force

## Units and Measures

g/kWh .....grams per kilowatt hour
gal/hr.....gallons per hour
hr/yr .....hours per year
lb/hphr .....pounds per horsepower-hour
hp.....horsepower
hphr/yr .....horsepower-hours per year
kW .....kilowatts
MMBtu/hr.....million British Thermal Units per hour
ppmw.....parts per million by weight
ton/hr .....tons per hours
TPY, tpy .....tons per year

## Pollutants

CO .....Carbon Monoxide
HAP.....Hazardous Air Pollutants
$NO_x$.....Oxides of Nitrogen
PM-10.....Particulate Matter with an aerodynamic diameter less than 10 microns
$SO_2$ .....Sulfur Dioxide
VOC .....Volatile Organic Compound

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# 1. Introduction

This Technical Analysis Report provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Air Quality Control Minor Permit AQ0318MSS02 to United States Air Force (USAF) for its Clear Air Force Station (CAFS). This minor permit authorizes the installation and operation of three new diesel backup generators at Building 800 of CAFS. The Department is issuing Minor Permit AQ0318MSS02 under 18 AAC 50.508(5).

## 1.1 Stationary Source Description

CAFS is located at Mile Post 284 on Parks Highway in Clear, Alaska. This is approximately 78 highway miles southwest of Fairbanks, Alaska. The primary mission of CAFS is to detect and monitor the behavior of satellites and space objects as part of the USAF Spacetrack Program. USAF operates a coal fired Central Heat and Power Plant at CAFS. The power plant supplies heat and electric power for the Base. The Central Heat and Power Plant is equipped with three identical chain-grate spreader stoker coal-fired boilers.

## 1.2 Permit History

The Department issued Permit AQ318TVP01 to USAF on Jan 21, 2000 to replace Permit-to-Operate No. 9531-AA001 and revised the operating permit administratively twice. On Feb 1, 2005, the Department issued Permit AQ0318CP01 to USAF to enable CAFS to avoid classification as a major source for hazardous air pollutants (HAP). On Oct 11, 2005, the Department issued Permit AQ0318MSS01 to USAF for a coal sampling project at CAFS. The Department issued Permit AQ318TVP02 on Sep 7, 2006 to replace Permit AQ0318TVP01 Rev 2. Permit AQ318TVP02 expires on Sep 6, 2011. CAFS does not have compliance problems.

## 1.3 Application Description

USAF will install three 2,500 kW diesel generators to provide backup power to keep the radar operational in the event of a catastrophic power failure. Beside emergency use, USAF will operate the generators monthly for testing and maintenance. USAF requests a combined 450 operating hours per year (hrs/yr) limit for the three emergency generators. The maximum design fuel consumption rate of each generator is 139 gallons per hour (gals/hr) and will burn Ultra Low Sulfur Fuel Diesel (ULSD) with sulfur content of 15 parts per million by weight (ppmw). The owner requested limits (ORLs) will keep emissions from the emergency generators from exceeding Prevention of Significant Deterioration (PSD) emission increase thresholds. Therefore, the operator does not need to demonstrate compliance with air quality standards.

Table 1 presents characteristics of the new backup generators.

**Table 1: Characteristics of Proposed Emergency Diesel Generators**

| Unit ID | Description | Make / Model | Rating / Size | Installed |
|---|---|---|---|---|
| 101 | Emergency Diesel Generator | Detroit Diesel 16V4000G83 | 2,500 kW | 2010 |
| 102 | Emergency Diesel Generator | Detroit Diesel 16V4000G83 | 2,500 kW | 2010 |
| 103 | Emergency Diesel Generator | Detroit Diesel 16V4000G83 | 2,500 kW | 2010 |

The Emissions Summary Form of the application provided characteristics of existing emission units (EUs) at CAFS. Table 2 presents characteristics of the existing EUs.

**Table 2: Characteristics of Existing Emission Units**

| Unit ID | Description | Rating / Size |
|---|---|---|
| 1 | Coal-fired Boiler #1 | 177 MMBtu/hr |
| 2 | Coal-fired Boiler #2 | 177 MMBtu/hr |
| 3 | Coal-fired Boiler #3 | 177 MMBtu/hr |
| 4 | Ash Handling and Storage | 30 ton/hr |
| 5 | Diesel Electric Generator | 1,000 kW |
| 6 | Diesel Electric Generator | 300 kW |
| 7 | Diesel Electric Generator | 150 kW |
| 8 | Diesel Electric Generator | 30 kW |
| 9 | Diesel Electric Generator | 30 kW |
| 10 | Diesel Electric Generator | 12.5 kW |
| 11 | Diesel Water Pump | 200 hp |
| 12 | Diesel Water Pump | 200 hp |
| 17 | Fired Building Heater | 0.35 MMBTU/hr |
| 18 | Fired Building Heater | 0.35 MMBTU/hr |
| 19 | Fired Building Heater | 0.185 MMBTU/hr |
| 20 | Fired Building Heater | 0.25 MMBTU/hr |
| 21 | Fired Building Heater | 0.25 MMBTU/hr |
| 22 | Fired Building Heater | 0.25 MMBTU/hr |
| 23 | Fired Building Heater | 0.35 MMBTU/hr |
| 24 | Fired Building Heaters | 0.95 MMBTU/hr |
| 25 | Fired Building Heater | 0.135 MMBTU/hr |
| 34 | Fired Building Heater | 0.483 MMBTU/hr |
| 35 | Fired Building Heater | 0.35 MMBTU/hr |
| 42 | Fired Building Heater | 0.185 MMBTU/hr |

# 2. Emissions Summary and Permit Applicability

This section presents emission estimates of the proposed and existing EUs. Emissions for the proposed generators do not exceed 10 tpy of any pollutant. Therefore the project does not trigger 18 AAC 50.502(c)(3) and does not need to demonstrate compliance with air quality standards.

## 2.1 Emission from Emissions Units at CAFS

Table 3 presents emissions for the proposed units and existing EUs. Table 3 does not include hazardous air pollutant (HAP) emissions. Total HAP emissions from CAFS are 8.31 tpy.

**Table 3: Potential Emissions from Emission Units at CAFS (tpy)**

| EU | Description | $NO_x$ | CO | PM-10 | $SO_2$ | VOC | Reference |
|---|---|---|---|---|---|---|---|
| 101 – 103 | Proposed Emergency Generators | 8.90 | 4.15 | 0.30 | 0.01 | 0.48 | See Table A-1 |
| 1, 2, and 3 | Coal-fired Boiler #1, #2, and #3 | 594.00 | 337.50 | 212.22 | 945.00 | 3.38 | 2008 CAFS Emission Inventory |
| 4 | Ash Handling and Storage | 0 | 0 | 8.30 | 0 | 0 | |
| 5 - 12 | Diesel Generators and Pumps | 20.32 | 4.54 | 0.80 | 0.57 | 1.00 | |
| 17 – 42 | Diesel Furnaces and Heaters | 3.33 | 0.83 | 0.39 | 1.91 | 0.06 | |
| **All Units** | **Point Source Total** | **626.55** | **347.02** | **222.01** | **947.49** | **4.92** | |

### 2.2 Assessable Emissions

The total assessable emissions are determined source-wide, but do not include pollutants that are emitted at less than 10 tpy, per 18 AAC 50.410. The existing assessable emissions are 2,130 tpy[1]. The new assessable emissions under Minor Permit AQ0318MSS02 are 2,143 tpy, which is the sum of the following potential emissions given in Table 3: 627 tons of $NO_x$, 347 tons of CO, 222 tons of PM-10, and 947 tons of $SO_2$.

### 2.3 Department Findings

The Department has made the following findings regarding CAFS' application:

1. CAFS is classified as a Title V source because it has the potential to emit more than 100 tpy of a criteria pollutant and is classified as a PSD Major because it has the potential to emit more than 250 tpy of a criteria pollutant.
2. The project is classified under 18 AAC 50.508(5) to limit increase in potential emissions of $NO_x$, $SO_2$, and PM-10 to less than 10 tpy. The ORLs ensure that the emissions do not exceed project classification thresholds under 18 AAC 50.502(c)(3).
3. CAFS will operate the proposed emergency diesel generators for a combined total of 450 hours a year and will burn diesel fuel with sulfur content not exceeding 15 ppmw.
4. The project qualifies as an off-Title V permit revision because it meets the applicable requirements under 40 CFR 71.6(a)(12).
5. CAFs is not located in a coastal district, therefore this permit action does not require Alaska Coastal Management Program review. Also permits classified under 18 AAC 50.508(5) do not require Alaska Costal Management Program review because the classification is not on the Alaska Coastal Management Program C list.

## 3. Permit Requirements

### 3.1 Requirements for All Minor Permits

As required by 18 AAC 50.544(a), a minor permit issued under 18 AAC 50.542 must identify the stationary source, the project, the Permittee, contact information, the requirement to pay fees, ORLs that apply to the source, and the applicable standard permit conditions in 18 AAC 50.345. The permit identifies the stationary source, project, Permittee, and contact information. The permit contains standard sections of a Title I permit. Standard sections of a Title I permit include:

(a) emission unit inventory that describes the characteristics of the emission units;
(b) emission fees that describe fee requirements and assessable emissions;
(c) section that describes general certification and information required of source;
(d) section on generic standard conditions needed to make the permit enforceable;
(e) section that describes applicable source test (if any) and monitoring requirements; and
(f) documentation that lists major events during the development of the permit.

[1] Sum of $NO_x$, CO, PM-10, and $SO_2$ emissions for existing emission units (EI1 through EU42) listed in Table 3.

### 3.2 Requirements for a Minor Permit issued under 18 AAC 50.508(5)

This permit authorized the installation of new emergency diesel generators EU101, EU102, and EU103. It is issued under 18 AAC 50.508(5) to avoid classification under 18 AAC 50.502(c)(3). A permit issued under 18 AAC 50.508(5) need not include performance tests to show initial compliance with state standards. Therefore, no initial compliance demonstration for Title I purposes is required for EU101, EU102, and EU103.

Per 18 AAC 50.544(h), each minor permit issued under 18 AAC 50.508(5) must contain terms and conditions that describe the ORL, including specific testing, monitoring, recordkeeping, and reporting (MR&R) requirements, list all equipment covered by the ORL, and describe each permit classification the ORLs allow the operator to avoid. Minor Permit AQ0318MSS02 describes the Owner Requested Limits (ORL), lists all equipment covered by the ORLs, describes MR&R, and states that the ORLs allow the operator to avoid classification under 18 AAC 50.502(c)(3).

CAFS requested a combined limit of 450 operating hours for the three new diesel generators. CAFS did not specifically ask for ORL for the sulfur content in the fuel but indicated the new generators will burn ULSD with sulfur content of 15 ppmw. The Department considers this limitation as an ORL because CAFS assumed the fuel sulfur limit in estimating emissions for the generators. The permit includes these ORLs. CAFS must monitor operating hours of EU101, EU102, and EU103 with non-resetting operating hour gauge on each of EU101, EU102, and EU103, record the information on permanent electronic log, and report the information in CAFS Annual Air Emissions Inventory Report.

### 3.3 Requirements for Periodic Affirmation

The stationary source has a Title V required by 18 AAC 50.326. Therefore the permit need not contain periodic affirmation that the application submitted by CAFS and permit issued by the Department still accurately describe the stationary source. CAFS must renew its Title V periodically. The renewals will capture changes the owner has made that require a new permit.

### 3.4 Off-Title V Permit Changes

The changes at the source allowed by this minor permit are off-permit changes because they satisfy the requirements under 40 CFR 71.6(a)(12) for the following reasons:

a. The changes do not violate any term or condition in the existing Operating Permit AQ0318TVP01 or any other existing permit issued for CAFS;
b. The change does not qualify for the permit shield in 40 CFR 71.6(f) and the permit shield in Section 12 of the Operating Permit AQ0318TVP01, Rev 2 issued for CAFS;
c. The minor permit application for this permit and the permit issued suffice as a written notice and record that describe the changes made at the source; and
d. The permit requires the Permittee to monitor, record, report, and keep records of changes that arise out of this permit action.

# 4. Permit Administration

The permit is issued under 18 AAC 50.508(5) to avoid classification under 18 AAC 50.502(c)(3) and allows CAFS to operate three new emergency diesel generators for a cumulative total of 450 hrs/yr while burning diesel fuel with sulfur content not exceeding 15 ppmw. CAFS has a Title V permit but the changes allow under this permit qualify as off-permit revision. Therefore, CAFS may operate under this permit upon issuance.

# Appendix A: Emission Inventory Calculations for New Generators

Application provided emissions for the existing EUs. However, for the proposed three emergency diesel generators, the application only provided emission estimates for $NO_x$, $SO_2$, and PM-10. The Department estimated CO and VOC emissions for the proposed generators because the Department's Emission Unit Information Form did not ask for CO and VOC emissions.

The three emergency diesel generators, each rated at 2,500 kW, and operating for a combined 450 hours per year, will produce an output of 1,508,625 horsepower-hours. Table A-1 presents emission factors of the generators, source of the emission factors, and tons of pollutant emitted by the emergency diesel generators per year.

**Table A-1: Emission Factors and Emissions for Proposed Emergency Diesel Generators**

| Pollutant | Emission Factor | Reference and Notes on Emission Factors | Tons/yr |
|---|---|---|---|
| $NO_x$ | 7.174 g/kWh | Engine specification from Detroit Diesel (manufacturer) | --- |
| $NO_x$ | 0.011794 lb/hphr | Converted to lb/hphr with 453.6 g/lb and 1.341 hphr/kW | 8.90 |
| CO | 0.0055 lb/hphr | AP-42, Table 3.4-1 | 4.15 |
| PM | 0.0004 lb/hphr | Air Force Emission Inventory Guidance, Table 29-4 | 0.30 |
| PM | 0.0007 lb/hphr | AP-42, Table 3.4-1 (for information purposes and comparison) | --- |
| $SO_2$ | 0.0000121 lb/hphr | As given in application, referencing AP-42 | --- |
| $SO_2$ | 0.00001214 lb/hphr | AP-42, Table 3.4-1, with 15 ppmw Sulfur fuel | 0.01 |
| VOC | 0.0006416 lb/hphr | AP-42, Table 3.4-1, with 91% of TOC assumed as VOC | 0.48 |

Table Notes:
Department's estimates of NOx, PM-10, and SO2 agreed with the applicant's estimates.